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Upwelling-driven reworking of a MTD's fine-grained plume: an example at the Cariaco Basin/Cariaco Gulf connection.

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The Cariaco Basin is a 1400 m-deep and 90 km-wide pull-apart basin, in the south-eastern corner of the Caribbean Sea. To the East, it is connected to the Cariaco Gulf, a 60 km-long, 15 km-wide, and 90 m-deep appendix. Both are E-W elongated and developed upon the south-eastern transform boundary of the Caribbean Plate, an active limit here mainly represented by the El Pilar Fault. The Gulf of Cariaco entrance is a 55 m-deep, and 5 km-wide sill mainly controlled by the large Manzanares River delta, which western foreset slope is facing the Basin's eastern edge. Within this connection area, two particular sedimentary processes have been previously documented:
1) strong seasonal upwelling responsible for the transfer of deep particulate organic matter from the Basin into the Gulf;
2) the recent occurrence, in the Basin, of a fine-grained suspension related to a submarine landslide; this event was detected after the 1997 Cariaco earthquake (Thunell et al., 1999; Lorenzoni et al., 2012) and was related to a slope failure of the Manzanares delta western foreset.

From short gravity cores retrieved in the Gulf, we analysed the last millennium of sedimentation (components, transport and settling processes) using classical proxies and physical properties. All parameters led to underline:
- a permanent mixed provenance of particulate Organic Matter in the main part of the Gulf: i) in situ and ii) allochtonous;
- the occurrence of coarse siliciclastic layers related to flooding from the southern edge of the Gulf;
- the occurrence of one peculiar fine-grained siliciclastic layer with a widespread distribution, dated around 1850 AD;
- an abrupt increase of open marine influence just after the above-mentioned layer.
Concerning the "background" permanent sedimentation, these results confirm the importance of upwelling through the connection between the Gulf and the Basin (transfer of the "allochtonous" O.M.). For the fine-grained silicilastic "event", we could discard a consequence of flooding from the Manzanares River. We rather envisage an upwelling-driven suspension brought from the Basin and dispersed into the Gulf. We tentatively relate the genesis of this peculiar load to a mechanism similar to what was described for the 1997 event.
A major earthquake-triggered tsunami occurred in 1853 in the concerned area, related to a MTD. We thus propose to correlate this peculiar layer with the 1853 event. Due to this earthquake and the associated tsunami, the upwelling transported fined-grained siliciclastics removed from the western slope of the Manzanares delta. Such a combination of a MTD-generated plume with the permanent upwelling may have occurred several times since the establishment of the connection during the post-MIS2 sea-level rise (Van Daele et al., 2011). The resulting specific layers may thus be used for paleo-earthquakes/paleo-tsunamis detection; furthermore, several major MTDs were imaged on high resolution seismic profiles across the concerned connecting area (Aguilar et al., 2015).
Ref.: Aguilar, I., et al., 2015. Comptes Rendus Geoscience, in press.
Lorenzoni, L., et al., 2012. Marine Geology, 307:105–110.
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